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Sustainability assessment of the energy projects implementation in regional scale

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Abstract

The concept of sustainable energy development cannot be separated from the understanding of additional positive socio-economic effect of sustainable energy projects (energy efficiency measures, use of renewable energy sources). Implementation of sustainable energy projects has positive impact on security of energy supply, provides financial economies and improved comfort and has multiplier effect for new jobs, involving small and medium size enterprises. Therefore integration of sustainable energy projects into regional development process may create external positive effect concerning increased energy security and other regional development goals (reduction of unemployment, reduction of environmental impact, etc.). The examples of EU-15 countries implementing their sustainable energy development and climate change mitigation policies on local level can be successfully applied in Lithuania. The aim of the article is to discuss methodological problems related with integration of sustainable energy projects into regional development procedures and provide guidelines, ensuring that energy elements may compile integral uniformity in terms of regional goals.

Keywords: Energy efficiency; Measures to promote energy efficiency

Contents

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1. Introduction

Following the review of the EU Sustainable Development Strategy (SDS) 2001 and National Sustainable Development Strategies in 2004, The European Council adopted on 9 June 2006 the renewed EU SDS for an enlarged European Union. A single, coherent SDS reaffirms the need for global solidarity and recognizes the importance of working with partners outside the EU. The overall aim of the renewed EU SDS is to support and promote actions to achieve continuous improvement of quality of life for all generations, through the creation of sustainable communities able to manage and use resources efficiently and to tap the ecological and social innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion. The key challenges of sustainable development addressed in updated strategy are: climate change and clean energy; sustainable transport; sustainable consumption and production; conservation and management of natural resources; public health; social inclusion, demography and migration; global poverty and sustainable development challenges.

The SDS and the Lisbon Strategy being mutually reinforcing target complementary actions, a use range of instruments and produce their results in different time frames. The implementation of the Lisbon mid-term competitiveness targets is key to the success to the achievement of the EU long-term SDS. The Lisbon Strategy provided EU with a governance tool and conceptual framework, but its implementation has to be accelerated, and a new momentum should be introduced.

New context of energy sector development with clear directions and targets defined by the EU directives forces to solve three main energy problems: competitiveness of energy markets, security of energy supply and environmental protection. These targets and measures aiming to implement them sometimes are conflicting. Big challenges are created by solving problems of energy supply security and competitiveness.

EURELECTRIC, the Union of Electricity Industry, has published the document, which states that the primary and fundamental target of electricity market liberalization aiming to increase the competitiveness of Europe has not serve this purpose. The main reason for that is that there are many not related policies, initiatives and directives across Europe and the achievement of three main purposes in parallel is complicated because different economic and legal tools, measures and mechanisms, sometimes conflicting with each other, are used. EURELECTRIC also has criticized governments for providing "substantial and unlimited" subsidies for renewable energy sources (RES). The association believes that a sustainable growth in this area can only be achieved through a regulatory framework, which complies with the rules of a competitive market. Maintaining that support schemes for RES therefore have to be market based, capital efficient and designed to avoid market distortions, EURELECTRIC calls for the harmonization of RES support schemes [1].

Creation of competitive energy market is very favourable for the increase in economic growth, however, security of energy supply, mitigation of environmental impact and energy affordability are the targets of sustainable energy development which can be achieved only by the implementation of wise energy policy by the Government. Therefore, the main role of the Government is reorienting energy policy towards the sustainable development. The problem certainly does not lie with the intrinsic goals being pursued as part of the completion of a competitive market. Development of RES and combined heat and power (CHP), implementation of climate change policies, improvement of energy efficiency (EE) and security of energy supply are all the necessary elements of sustainable energy future that will not necessary be delivered by market forces alone. "The problem lies with current inconsistencies, lack of market integration and frequent absence of a least-cost approach. A patchwork of policies, burdens and new regulations, keeps building up without sufficient coherence, balance or properly thought-out economic assessment. As a result, the essential aims of regulatory consistency, avoidance of market distortions and use of least cost solutions are far from being met" [1].

2. The problem of economic theory

The classical approach to solving problems above presents applied welfare analysis. Efficient resource allocation occurs in the way energy is priced. At any time, the price of the energy resource should reflect its marginal social cost. This implies that any divergence between social and private cost arising as a consequence of the market failures (for example, public goods or externalities) should be corrected by internalizing such external costs. To assure the equivalence of price and marginal costs, a competitive market framework is required. Monopoly elements are to be eliminated if prices are not equal marginal costs. Applied welfare analysis allows to quantify the welfare loss associated with any given market failure. This enables policy makers to focus on the market distortions. But even though a policy change leads to an aggregate welfare gain, certain groups may suffer deleterious income distribution

loss. Again this implies need to create welfare system to redress burdens imposed on the poor as a consequence of an efficiency generating policy change.

The main problem that according theoretical concept the market consists of economic agents operating under perfect competition conditions. All market-based mechanisms provide for efficient resource allocation just under perfect competition which is not available in reality. An urge for a liberalization of global trade has been sweeping anonymous over the world without any public debate and without even asking what are the benefits. Indeed a market economy is excellent on a certain scale. Today it is no longer a free market. From a democratically controlled market we have then moved to a market controlled by the big market forces themselves. The criteria behind the economic theories of the advantages of a free market no longer exist [2].

Even worse that methodology of cost–benefit analysis where the positive or negative effects of increasing energy supply security, social, environmental, economic impacts are treated not as externalities but as normal commodities. The main difficulties arise that atmospheric pollution and external costs than economic theory is applied in practice are treated as commodities. The following theoretical considerations reflect this problem: ‘‘A common logical error is to identify a source of pollution and automatically conclude the existence of a market failure and thus a welfare loss. Recall that externalities exist when private valuations of costs or benefits differ from Social valuation of costs and benefits… Voluntary (!!) agreements between the polluters and affected parties can achieve the socially optimal outcome… Even when private transactions are not capable of equilibrating private and social valuations, governmental policies may. Critical policy question is not whether pollution exists but rather whether it occurs at socially optimal level. The economic approach to pollution control is to view clean air and water as commodities like gasoline and air conditioning, to be provided according to the Standard criteria applied to all goods. The last unit of clean air or water should confer a marginal social benefit just equal to the marginal social cost of providing it’’ [3].

This problem is transferred into problem of national accounting than the growth of GDP indicates the constant progress. However the investigation of economic growth and valuation of environment corrects the optimistic result provided by constant national income and GDP growth in developed economies [4].

2.1. Correcting the GDP as indicator

We will here briefly take up the discussion on which indicators are relevant to use when aiming for a sustainable development. Attempts have been made to correct the GDP. One is the ‘‘Genuine Progress Indicator’’ (GPI) shown for USA in Fig. 1 [2]. With some rather modest and very reasonable adjustments of the GDP, the trend is a decline since around 1965, and with the present level lower than ever in more than 45 years. One of the changes is that in this GPI the cost of restoring environmental damage is counted negative rather than positive, as is the case in the GDP. Despite the indication that with the present trend people are getting worse off year by year, the politicians in USA and other affluent countries are dedicated to pursue the same conventional target, which means the downward trend for GPI.

Another alternative to GDP was the Index of Sustainable Economic Welfare (ISEW) which showed similar trends. While these attempts clearly show the incompetence of GDP, none of them claim to have found *the* right indicator.

According economic theory the problems related with achievement of sustainable development goals can be

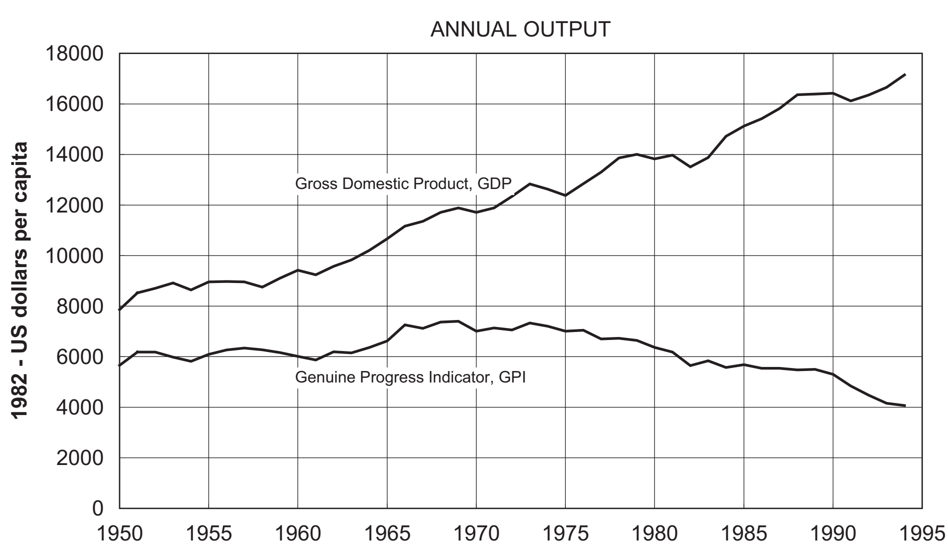


Fig. 1. The conventional Gross Domestic, GDP, is here for USA compared with the Genuine Progress Indicator. Source: Norgard [2].

solved in balancing marginal social costs and marginal social benefits. This theoretical concept opens the pathway to "sustainable development" not restricting the growing fierce demands of consuming society. This is truth that the growth of GDP is being pumped by growing consumers demands. A major shortcoming of the above-mentioned attempts to adjust the conventional GDP might be that they still aim at just one number to encompass the diversity of what makes up a life and a culture.

3. Evaluation of sustainable energy projects in the context of economic theory

Generally there are two appraisals (financial and economic) that consider money (other appraisals may consider safety, environmental impact, etc.). The financial appraisal tries to see if the project will work as a business proposition. In other words it considers only those costs and benefits which are relevant to the business entity undertaking the project. A financial appraisal looks only at the effect of the project on the 'bottom line' of the firm or enterprise. The economic appraisal attempts to decide if the flow of benefits is greater than the flow of costs, measured according to broader socio-economic criteria. Factors such as employment effects, environmental impacts, balance of payments effects and poverty alleviation might be taken into account. It is possible for a project to pass an economic evaluation, but to be untenable as a business proposition; if a government wants the project to go ahead and is prepared to pay, it may decide to use some public money or 'soft' finance from other sources. One solution to the problem of making projects work as business propositions has been for lenders to require "sovereign guarantees" and then rely only on economic appraisal to justify the project to the borrower government. The World Bank almost exclusively lends in this way and so, from their perspective, economic evaluation is the most important factor in deciding if a project goes ahead. It is also possible for a project to fail an economic evaluation, but nevertheless to represent a good business proposition. A typical example of this situation would be where society bears the cost of negative environmental effects of a project. One important purpose of government regulatory or fiscal measures is to prevent a situation arising where it is profitable for a firm or a private individual to act in a way which results in a net cost to society. The externality is said to occur whenever a third party (i.e. somebody not directly involved in a transaction) incurs a cost or enjoys a benefit as a result of a transaction. The classic example of an externality is pollution; car exhaust fumes do not distinguish between drivers and non-drivers, but enter everybody's lungs indiscriminately. Car drivers reap the benefits of using petrol, but part of the cost is borne by those whose quality of life is affected by pollution. Unless specific steps are taken by governments to internalize these costs, for example by introducing pollution charges, they remain external to the market. Where an energy project is being sponsored by a government, it is common for externalities to be valued as far as possible and incorporated into the project appraisal. This is because a government should be concerned with the wider welfare implications of its activities, beyond their immediate income-generating potential. It is generally assumed that the private sector need not concern itself with including externalities in investment appraisals as they are concerned only with the 'bottom line'. However, there are two reasons why an energy project sponsor in the private sector might be concerned with externalities:

- If "soft" finance is to be sought from bodies such as the Global Environmental facility (GEF), or bilateral aid programmes, it is very often a condition that projects should demonstrate a wider economic benefit, and externalities (either generating positive externalities or minimizing negative ones) are one aspect of this.
- Over the lifetime of the project, there is a likelihood that the government of the host country might introduce or tighten regulatory or fiscal measures to control or internalize externalities, especially environmental ones. This eventuality might have a significant effect on the viability of the project.

A number of techniques are available to incorporate externalities into the investment appraisal process. The choice of technique depends to a large extent on the nature of the externality itself. The following sections examine some of the common externalities which analysts might wish to take into account, and illustrate the types of technique available.

4. Methodological approach

There are no accepted methodological approach allowing to evaluate efficiency of projects in terms of sustainability on the regional level. There are several methodological achievements in this field which can be used to solve the problem. The solution proposed in our article include the synthesis of rational methods used in practice but these methods are integrated by applying the new approach towards evaluation of sustainability on local level.

1. The environmental pollution and other negative externalities cannot be treated as commodities.
2. The private interests in the competitive environment are the main engine of private business development however it should be harnessed for the regional sustainable development.
3. The investment project should be integrated in regional development programmes and theoretical background can be developed including strategic impact assessment approach; multi-criteria stated-preferences or revealed preferences approach, sustainable value concept, etc.
4. The practical implementation can be achieved though the structural funds (SF).

The three methods to assess the sustainability of energy projects and provide financing of SF for these projects are described below.

4.1. Sustainable value concept

Value oriented methodology to assess the sustainable performance of companies and other economic entities, called sustainable value [5]. Authors proposes a new approach to measure corporate contributions to sustainability called sustainable value added (SVA). Value is created whenever benefits exceed costs. Current approaches to measure corporate sustainable performance take into account external costs caused by environmental and social damage or focus on the ratio between value creation and resource consumption. As this paper will show it is more promising to develop sustainable measures based on opportunity costs. SVA is such a measure. It shows how much more value is created because a company is more efficient than a benchmark and because the resources are allocated to the company and not to benchmark companies. The concept of strong sustainability requires that each form of capital is kept constant. As SVA is inspired by strong sustainability, it measures whether a company creates extra value while ensuring that every environmental and social impact is in total constant. Therefore, it takes into account both, corporate eco- and social efficiency as well as the absolute level of environmental and social resource consumption (eco- and social effectiveness). As a result, SVA considers simultaneously economic, environmental and social aspects.

From a theoretical point of view these concepts provide very powerful measures of corporate contributions to sustainability because they thoroughly translate the requirements of the constant capital rule on the macro level into measures for the micro level. However, there are a number of shortcomings and problems. Here VA of a company is defined as the residual value that remains after the turnover has been reduced by the cost of goods and services purchased by the company. SVA represents the aggregate of all energy and material flows under consideration induced by economic activity weighted by their relative harmfulness to the environment. This aggregation is done by classifying every emission according to its contributions to different environmental problems which are then weighted by their relative harmfulness (for methodological details see e.g. [6]). Eco-efficiency describes the degree to which a company uses environmental resources relative to its economic.

The SVA presented in this article constitutes a new way to measure corporate contributions to sustainability. The concept can be used in practice, as it is based exclusively on information that is available in the UK market today. It requires information on the eco- and social efficiency of the company and a benchmark as well as on the economic performance of the company. It is not necessary to monetarize the external costs of environmental and social impacts.

SVA considers efficiency *and* effectiveness of all three dimensions of sustainability. Because it shows the amount of value created while ensuring a constant environmental and social performance, SVA is based on the paradigm of strong sustainability. Put differently, SVA represents in monetary terms the extra value created by a company adjusted for all changes in eco- and social effectiveness. Compensation in this context does not mean paying victims for accepting external effects, which would imply weak sustainability and thus substitutability of different forms of capital. Compensation for calculating SVA refers to a purely allocative question and means paying other, less eco- or social-efficient users of resources to reduce exactly the environmental and/or social impacts in question. This results in a constant overall level of eco- and social effectiveness. As only identical environmental or social impacts are considered in that kind of compensation substitutability between different forms of capital does not matter. SVA is thus based on the paradigm of strong sustainability.

SVA as developed in this article provides a new approach to measure corporate contributions to sustainability. However, this paper focuses on method development rather than on the implementation of the method. Therefore, we see need for further research in two directions: on the one hand, empirical surveys are needed that apply the method to a wide range of companies of different industries in order to examine both the practicability of the method as well as the results it elicits in real world terms. On the other hand, future studies should investigate the institutional and organizational conditions and arrangements of some kind of trading or market scheme to implement SVA. In addition, SVA is limited to the effect that it does not indicate, if a company is sustainable. It shows, however, how much a company has contributed to more sustainability. This contribution can be expressed in either economic, environmental or social terms. When expressed in economic terms, SVA expresses in absolute monetary terms the sustainable performance of the company relative to a benchmark. By establishing such a micro–macro link it expresses by how much a company contributes to more sustainability on the benchmark level.

4.2. Multi-criteria analysis

The multi-criteria analysis can be also applied for the selection of sustainable energy projects to be financed from SF. The criteria for the selection of sustainable energy project having positive impact on sustainable regional development are: efficiency, impact on environment expressed in terms of external costs, impact on job market, equity, technological innovation and security of energy supply. When policy-makers and stakeholders are asked to select the best project they have to find a solution that gives the best outcome in terms of the criteria mentioned. However, it is difficult to identify project that outperforms the others in terms of efficiency, impact on environment,

the job market, security of energy supply, equity, technological innovation. The choice of the project will require some trade-offs among these criteria [7].

Conjoint choice analysis can help investigating how policy-makers and stakeholders trade-off the criteria when designing a policy for the internalization of the externalities, selection of investment projects for financing, etc. Conjoint analysis and other stated-preference (SP) techniques have recently emerged as a complement to revealed-preference (RP) techniques. While RP evaluate economic agents' behaviours in real markets, SP involve choice responses evoked in hypothetical markets. The interest in hypothetical behaviours in economics arises from different reasons, such as the necessity to investigate economic agents' preferences for new policies that might be implemented, for evaluating goods that are not traded in real economic markets. This method is applied than it is not possible to estimate agents' preferences using revealed preferences. During the choice experiments individuals or policy makers are asked to choose between two or more projects described by a set of attributes or criteria (environmental impact or external costs of the project, impact on security of supply, equity, job market, etc.). The levels of the attributes are varied across the projects, so that respondents trade them off, and one of them is usually a cost amount (for example external costs) which allows the computation of marginal prices of the attributes which is difficult to evaluate in monetary terms (for example impact on security of supply [8]).

In a single choice experiment exercise researchers learn only which alternative is the most preferred, but the result of the exercise does not tell anything about the preferences for the options that have not been chosen. A single choice experiment exercise does not offer a complete preference ordering. Therefore, if researchers want to know a complete ordering of preferences it is necessary either to ask a respondent to do many choice exercises, or to survey more respondents varying the levels of the attributes [9].

4.3. Strategic environmental assessment

Another measure for sustainability assessment of energy projects is strategic environmental assessment (SEA). It allows for integrating of environmental considerations into economic development which has received considerable nominal support amongst governmental and non-governmental groups is the SEA of development-related policies and programmes. SEA Directive 2001/42/EC was adopted 31 May 2001. A wide range of plans and programmes begun after 21st July 2004 now require an environmental assessment. The purpose of the SEA-Directive is to ensure that environmental consequences of certain plans and programmes are identified and assessed during their preparation and before their adoption. The public and environmental authorities can give their opinion and all results are integrated and taken into account in the course of the planning procedure. After the adoption of the plan or programme the public is informed about the decision and the way in which it was made. In the case of likely transboundary significant effects the affected Member State and its public are informed and have the possibility to make comments which are also integrated into the national decision making process. It is expected that SEA contributes to more transparent planning by involving the public and by integrating environmental considerations. This will help to achieve the goal of sustainable development.

However the culture of economic development is still resistant to the broader integration of environmental concerns. The integration of strategic impact assessment procedure for project appraisal and selection should be critical in use of SF. As far as SEA concerned, the experience gained in the 1990s has shown that it has been a considerable advance in practice both procedurally and methodologically at the level of programmes and plans [10,11]. The most important issue is the change in the culture of economic development, and a reinterpretation of the usual quality-of-life measures could promote better integration of environmental and economic strategies: not only through using environmental appraisal criteria but by greening local economies through promoting certain projects. The process of sustainability appraisal could lead to an adjustment of economic development programmes to deliver sustainable energy projects.

All these three approaches described above can be successfully used for the integration of sustainable energy projects into regional development programmes.

5. Framework for sustainable energy programmes

5.1. Methodological problems and solutions

Methodological approach above is suitable for sustainability assessment using regional social-economic-environmental indicators, as increasing of security of energy supply, new jobs, new enterprises, additional economic product, greenhouse gas reduction. The methodology of integration of sustainable energy projects into local/regional development programs has been elaborated as a key to integrate sustainable energy projects into the regional deployment level [12].

The first link, *supply technology*, includes technologies like power plants, refineries, district heating plants, windmills, etc. They convert the *primary energy*, like coal, uranium, wind, etc. into *secondary energy*, (also sometimes termed *energy ware*), which is usually the type of energy sold to the final consumers. Electricity is a typical form of secondary energy. But also gasoline, charcoal, kerosene, and other forms of energy are marketed and utilized at the end-users. The supply technologies have usually been developed into rather efficient systems, because they are run on a commercial basis, often by big businesses.

The next major link is the *end-use technology*, which converts secondary energy into *energy services*, like a good

indoor climate, cool storage for food, illumination, clean laundry, a warm meal, just to mention a few examples from the private homes. The end-use technology include for example houses, refrigerators, lamps, and cooking stoves. They are usually not very efficient at all. As we shall see later, they can typically be made three times as efficient, meaning that they can provide the same service with one third of the secondary energy input.

It is a prerequisite of the planning for sustainability to be aware that *energy is of no direct value to human beings* (when excluding food energy). Only the energy services can be useful. Hence it is highly misleading to use for instance the electricity consumption per capita as an indicator of people's well-being, even though it can seem to make sense for a statistic consideration.

5.2. Sub-optimizing versus integrated resource planning: the method of regional energy programmes

As mentioned, to some extent the energy supply system is quite efficient, simply because it is optimized also from an economic point of view. This does not necessarily imply that it is optimized from the view of total cost, including the *external cost*, such as environmental cost. Even with those externalities included, however, optimizing the supply technologies constitutes a *sub-optimizing* only as compared to considering the whole energy chain.

Integrated Resource Planning, IRP, is a methodology which should avoid the sub-optimizing. The idea of IRP (or least cost planning, which is a similar concept) is that we should not optimize the single links in the chain, but the chain as a whole. So far the IRP has been interpreted to include only the links up to the energy services. As an example, if it is less costly to save a kWh of electricity in the end-use than to produce a kWh, then the investments should be directed not to building new supply, but to save secondary energy and hence provide the energy services at the lowest cost. If this was taken seriously in Western Europe, for instance, there would hardly be a need for any new electricity supply system for a decade or two, since the investment in electricity savings would be more profitable, both from an economic and an environmental point of view. In most developing countries, an IRP would lead to a much lower need to invest in expensive supply systems.

It is important to recognize that you cannot optimize the energy chain as a whole by separately optimizing the single links. You cannot optimize and sub-optimize at the same time. Each time an investment is made in an electricity supply in order to optimize the supply, it is a sub-optimization, because it might have prevented the money to be invested in more efficient end-use technologies, even if that would be more cost-effective and hence optimal. In economic terms: a more optimal electricity system is one that gives the consumer the energy services at a lower bill (including environmental externalities). The kWh-price might very well be for instance 20% higher in a more optimal system if the electricity consumption is say 40% lower.

It must be taken into account that each country has its own problems, which are to be solved according to the situation in a particular country. Following the Netherlands' experience of climate policy management, an overall framework of the sustainable energy strategy could be presented as follows:

- Municipal sustainable energy policy should be based on a covenant between government and representative bodies.
- Local sustainable energy plans are based on the national sustainable energy strategy.

Implementation of National sustainable energy strategy should be supported by sharing the tasks on the increased share of renewables and EE improvements between regions and authorities [13]. Moreover, the next SF programming period 2007–2013 is crucial for the implementation of sustainable energy into practice. It should be focused on the regional and local sustainable energy programmes as a whole (not only on vertical themes).

The fact that municipalities can link their climate policy to their own local themes, makes climate policy to be defined as vivid, specific and recognizable. This removes the risk of vagueness and the feeling that it has no relevance to local issues. Improved traffic situations, sustainable business parks, healthier houses and less pollution: these are the points that enter the picture thanks to climate policy. Municipal climate policy is then easy to sell and it continues to working because of its supporting base and image. From the organizational point of view, too, climate policy brings benefits for a municipality. Municipal climate policy works according to a model of policy options. This enables the municipality to give shape to sustainable, realistic aims within a clearly defined structure.

Establishing a regional market rather than local renewable energy market could help to ensure a market of a sufficient size and enhance the competition. In addition, a regional approach could be an important element in the Kyoto follow-up work.

In the Netherlands, wind energy parks and biomass power plants are often implemented on a regional scale. For individual municipalities, however, local opportunities also present themselves. The purchase of green power for their own buildings, constructing new buildings with an optimum sun-facing position, supporting the marketing of solar energy: all these things are within the reach of every municipality and contribute substantially to reducing CO_2 in built-up areas.

Municipalities occupy a key role when it comes to energy saving in existing housing. They are involved right from the beginning in renovation and restructuring plans and have a decisive contribution to make to energy saving and energy provision. They can make agreements with housing

associations about the quality of energy in the rental sector. The municipality can also exert its influence on individual homeowners. For example, it can approach homeowners specifically to suggest that they have their energy consumption analysed. This will enable homeowners to make responsible choices from the available measures to both save energy and increase their own comfort.

However, there is a need to support this process, and the most feasible solution could be based on the local programming approach.

The main methodological problem is to integrate EE and RES projects into regional/local development procedures, so that energy elements may compile an integral uniformity in terms of regional/local goals. The most difficult problem is to have municipal officials that are willing and cooperative. A very important issue is to define a possible external positive effect of energy project in the framework of local/regional policy directions (financed by SF), and summarize these effects as a total input of energy projects' implementation.

An additional positive effect on energy saving, EE measures and RES most often compile with the local and regional development objectives:

- RES, being indigenous sources of energy improve the security of energy supply and diversity of the fuel mix.
- RES have advantages for regions, in which power and heat supply costs are considerably higher than average costs in the country. Thus the use of RES—electricity and heat in small isolated systems can also help to avoid or delay expensive extensions to the grid.
- Some RES are a labour intensive form of industry and create jobs especially at location sites in rural areas.

Method of evaluation of the above-named advantages to be included into the evaluation process in feasibility studies is under elaboration. The methodological approach for solving this problem and consequently integrating energy projects into a regional/local development process has been drafted by [12].

Therefore, the preparation of financial perspectives for 2007–2013 is crucial, and regional development must be energy sustainable. Many resources of SF resources are to be used in a most sustainable way, which means that economic, social and environmental aspects should be accounted for. The tools (multi-criteria decision aiding based on SF and RP, SEA, sustainable value added, etc.) for the selection of the best sustainable energy projects should be applied in decision making.

The concept of sustainable energy development cannot be separated from the understanding of additional negative and positive social-economic effect of EE measures, energy savings, implementation of RES. For example, projects on EE improvements allow to save energy costs and have the multiple effects on new jobs creation, disperse across the community both socially and spatially, involving small and medium size enterprises (SME). The indicators to be used describe the contribution of energy projects to a sustainable economic development, the medium- and long-term trends and the inter-relationship between them and the typical energy indicators (saved toe, improved EE, percentage of RES).

The energy service level is here used to indicate the aspects of economic development, which are relevant to the energy system. This service level can be indicated by different physical parameters like the dwelling size available per capita or the amount of cement produced per year. For a country as a whole is often used the GDP, which has earlier been described as quite insufficient to indicate the development of people's well-being.

5.3. RUSE PROJECT—redirecting urban areas development towards sustainable energy

The main issue is that the sustainable energy development would be treated as a set of separate good practice case studies or the quantitative jump would be performed in organizing the implementation of sustainable energy development process. The exchange of practices, based on sustainable energy aspects, is the key to promote the development of projects at the local level, satisfying the requests of the programme level.

An INTERREG IIIC Programme project RUSE (Redirecting Urban areas development towards Sustainable Energy) has been launched in order to transfer experience of EU15 to the New Member States (NMS) in the field of sustainable energy projects, financed by the SF. In this project the exchange of experiences represent a very important European Added Value.

Since 2004, the SF are available in the NMS and are clearly an opportunity for linking sustainable energy and urban development by creating and stimulating the integration of energy issues in urban development policies, including all its impacts on the environment. Experience has already been gained in the EU15. Sometimes this has been a bad one, for instance when the SF have not been used in the best way by promoting infrastructure projects, without taking into account their impact on natural resources or climate issues. There are environmental impact assessment (EIA) regulations available in all EU member states, however, standard EIA procedures are not always able to assess all impacts on human health and natural resources provided by infrastructure projects.

On many other occasions it has been a good experience, for example, when energy issues have been considered from the point of view of energy demand and promotion of local renewable resources rather than simply from that of the supply side via investment in grids and trans-national networks. This experience must be used by NMS to avoid the same mistakes and to integrate these aspects in the preparation of the projects, as requested by the rules of European Regional Development Funds (ERDF).

However, practices which should be the standard often still are the exception, and a majority of new infrastructure

or building projects, as well as major renovation schemes, are still carried out without any consideration being given to their energy impact, in spite of the EU defined priorities for the control of energy demand and for limiting CO_2 emissions.

Energy issues are not the most visible part of local planning, compared to the construction or even to the renovation of infrastructure and buildings. EE and energy saving measures are Community priorities, which should be automatically included in the requisites of projects applying to a support from the SF.

The RUSE operation aims at improving the use of SF and other financial resources by municipalities and other stakeholders in charge of urban development issues in NMS and candidate countries, thus progressing towards a better integration of sustainable energy issues (EE, renewable and distributed generation) in their projects.

To achieve the improvement of the use of SF, the RUSE operation has the following four main objectives:

- To make municipalities and related bodies in NMS and third countries more aware of existing SF related experience in European countries by disseminating information, promotion good practice and exchanging experience.
- To improve capacity building on energy issues in both individual bodies (municipalities) and collective structures (city networks, agencies, etc.).
- To prepare municipalities so that they can design projects dealing with their powers and responsibilities in a sustainable manner and to enable them to submit successful proposals under ERDF programmes (incl. INTERREG IIIA, URBAN, etc.). In other words, to help them integrate the concept of sustainable energy in urban plans and put them into practice.
- To influence national decision makers regarding the integration of energy issues in their programmes from the point of view of energy demand and the promotion of renewable energy, both of which are good methods for promoting local development.

5.4. Local programming approach to sustainable energy development: Netherlands experience

The new legislation will allow the integration of EE as eligible measure in the next SF. Because of subsidiarity and co-financing requirements, it is important to convince those behind the Community Support Frameworks in the NMS that EE and renewables go hand-in-hand with traditional structural and cohesion targets, such as increased employment, improved competitiveness, improved local environments, and improved infrastructures. Investments in EE in buildings, for example, are extremely cost effective. They are often cost-free because the cash flow from reduced energy consumption pays off the investment long before the technical lifetime of the investment. This cash can then be re-invested locally and regionally. These investments use much unskilled as well as semi-skilled, and skilled labour. There are similar examples in industry and transport. Successful energy programmes, such as Valoren could also serve as a model for NMS'' [14].

The most suitable tool for redirecting urban areas towards sustainable energy could be local programs. Municipalities have both policy instruments and means to implement them and, moreover, they are in direct contact with citizens and business. Sustainable energy policy linked to specific national measures could contribute to reducing and managing energy and environmental problems in general and greenhouse gases in particular. A very interesting example is the experience of Netherlands. Municipal climate policy has been operating since 2001 in Netherlands. Since then, more than 150 municipalities have made a start. Dutch municipal climate policy is based on a covenant between central government and representative bodies from the municipalities and provinces. The tasks are clearly defined: broadly speaking, central government focuses on identifying the climate objectives, including basic standards, furthermore, acts as a facilitator, while the municipalities will be the ones that actually do the work. The Ministry of Housing, Special Planning and the Environment (VROM) makes subsidies available so that municipalities can release an extra capacity for implementing the policy. The level of these subsidies is linked to the degree of ambition and the actual results achieved. A total of 37 million euro has been made available for the coming years.

The underlying principle for climate policy implementation is therefore that municipalities decide for themselves the topics on which they will focus their policy. They, better than anyone else, know where the best chances of success lie. They can build on previously developed environmental and other measures. And they understand how to make the policy fit local circumstances and needs. Each municipality chooses its own theme(s): municipal buildings and installations; sustainable energy etc. Before a municipality can get to work on one or more themes, it attaches a level of ambition to it. This serves to indicate how far the municipality wants to take this theme. Distinctions are made between an active policy, a leading policy and an innovative policy. Based on the outcome, the municipality establishes its policy for the next 5 years. This policy is then implemented by means of a phased plan, which is also provided by the municipal climate policy programme.

6. Guidelines for sustainable energy development using SF co-financing for Lithuania

The guidelines for the implementation of sustainable energy development policy can be elaborated by integrating targets of sustainable energy strategy in the framework of municipal strategic development plans.

6.1. Context of sustainable energy development in Lithuania

The energy use in Lithuania is considered as a basic driving force that impacts environment. It is a major contributor to environmental problems of global concern, such as climate change, acidification, and urban air pollution. Energy is crucial for economic and social development, quality of life and consumption level. According to sustainable development concept it is necessary to incorporate sustainable development goals into all sectoral policies [15].

The main long-term planning document *Long-term Lithuanian Economy Development Strategy* was approved in 2002. It comprises 15 branch strategies. The main principles of sustainable development are integrated in these strategies. Some of these branch strategies are directly aimed at the interaction between sectors (factors of social development and economic factors of employment, economic factors of environmental protection, tourism development, etc.). Despite a great integrity of certain strategies, there is a lack of clear relations between the aforementioned 15 strategies. In order to solve this problem the National Strategy of Sustainable Development was adopted in 2003. This strategy encompasses six branches of economy (transport, industry, energy, agriculture, household, tourism), four environmental sectors (air, water, biodiversity and waste), four main social aspects (employment, poverty and health, education, cultural identity), and regional development issues. All these economic, social, environmental and regional development issues are presented in close integrity. Sustainable development indicators for economical, social and regional development, and state of environment are selected in the strategy for the monitoring of sustainable development, however, this system of indicators were not applied for the analysis of trends, and only some targets of sustainable development were set using these indicators. An approach to integrate sustainable development indicators into national planning systems should be used with more extent according the following steps:

- To set targets of sustainable energy development.
- To analyse trends and interlinkages of selected indicators of sustainable development.
- To formulate response actions based on the performed analysis.
- To monitor the progress achieved towards set targets.
- To evaluate the efficiency of implemented policies.

The sustainable energy development indicators approach can be used to illustrate preparation of SDS [16]. Energy sector is the priority sector in economic development because energy is closely connected to social and economic development, quality of life, its production and consumption has a significant impact on the environment.

6.2. Theoretical model of the implementation of National Sustainable Development Strategy via local energy programmes integrated in cities strategic development plans

Using data on the good practice case studies from data base developed by RUSE project we can conduct a theoretical experiment: to integrate a complex of good practice case studies (GPCS) in Vilnius city strategic development plan, taking into account the priorities of Lithuanian National Sustainable Development Strategy [17], including priorities for sustainable energy development strategy as well. SDS for 2002–2020 establishes the following targets relevant to sustainable energy:

- Economic growth balanced between economic branches and regions, not limiting growth in fast-growing sectors, but providing more support to the underdeveloped sectors and regions.
- Minimization of social and economic differences between regions and within regions.
- Minimization of environmental impact from the main sectors.
- A more efficient use of natural resources and waste management.
- Minimization of impact on human health.
- Climate change mitigation.

The main targets relevant to sustainable energy development expressed in indicators:

1. To reduce energy intensity of GDP by 50% up to 2020.
2. To reduce CO_2 and other pollutants emissions per GDP unit by 50% by 2020 compared to 2002.
3. To reach the share of renewables—12% in TPES by 2010 and 15% by 2020.
4. To reach the share of CHP—35% of total electricity production by 2020.
5. To reach the share of renewables—10% in total electricity production by 2010.
6. To reach the share of biofuels not less than 15% in transport fuels by 2020.

All these targets were set in Lithuanian National Energy Strategy [18] and should be implemented on the regional levels. The urban strategic development plans of cities should integrate the sustainable development targets established by the National Sustainable Development Strategy. For example, these priorities the main goals and objectives were defined which are fitting well in sustainable development targets established for Lithuania in SDS. Using the best practice case studies data base which consists of 17 Good practice case studies prepared during RUSE activities, the set of projects can be implemented in Vilnius, matching the priorities, goals and objectives of Vilnius strategic plan and the targets of Lithuanian SDS.

The scheme of selection of good practice case studies in redirecting Vilnius towards sustainable energy development

based on the targets of SDS priorities, goals and objectives, established in Vilnius strategic plan (more details in Klevas et al. [19]). It is obvious that such an approach is feasible, however, for its implementation the preconditions are necessary by developing new single programming document (SPD) and drafting new operational programmes, increasing financial support for sustainable energy projects in SF, solving some methodological problems and reinforcing the development of special preconditions for projects' eligibility. The national targets need to be implemented on the local level by integrating them into local strategic development plans, applying a similar approach, which has been presented for Vilnius strategic development plan above.

The three approaches described in the article: sustainable value concept, multi criteria analysis and SEA can be successfully applied in selection of sustainable energy projects (good practice case studies) to be integrated in regional development programmes and submitted for the financing from SF. These methods can be used to compare, rank and select sustainable energy projects according their impact on sustainable development goals in the region.

6.3. Planning as an iterative scenario process

Energy planning should not be reduced to prediction of what is most likely to happen, whether we are talking separately about supply or demand. The purpose of planning is normally to be able to shape the future. But if the planning activity is suggesting just one option—one way people could live in the future—the democratic element is lost. Even when we have to limit the options to those which are environmentally sustainable, there will be room for a vast diversity in the ways people can live. Obviously, however, some types of extravagant lifestyles might not be permissible, because they are unsustainable and hence severely shrink the options of other groups of people or of future generations.

The three determinants, the developments in population, economy, and technology are all being shaped by human activities, individually or through political and corporate systems. And so they will be in the future. The question is who are shaping them and towards which goals. In energy policy there has been a tendency to consider change in the *technology* as the only option for political regulation, ignoring population as well as economy and lifestyles as parameters in an energy and environment policy.

7. Conclusions

The economic development should be shifted away from energy and resource intensive industries, clean-up technologies towards the development of clean technologies and knowledge intensive industries which are environmentally effective and economically efficient in the long-term and provide for sustainable development. It is increasingly recognized that integrated package of environmental, social and economic policies is more likely to be achieved at a local level and state expenditures (financing from SF) should whenever possible allow for achievement of more than one policy objective.

Sustainable energy development in regional scale needs organizing and implementing institutions, actors, support measures and procedures etc. Municipalities may play considerable role by promoting sustainable energy because of local authorities are fulfilling their functions in the energy sector via number of roles. The sustainable energy development should be implemented in local level applying subsidiary principle. The EU SF can be used as the main financing source for the implementation of local sustainable development.

The sustainable value concept, strategic impact assessment procedure, multi-criteria analysis approach, including stated preferences and revealed preferences techniques to trade-off between sustainability criteria can be applied for the selection of sustainable energy projects (good practice case studies) to be integrated in sustainable regional development programmes and presented for the financing from SF.

The culture of economic development is still resistant to the broader integration of sustainable development concerns in planning and decision making process. It takes time and experience to adjust well-established modes of decision making and ways of thinking in order to exploit to the full the new procedures, institutions and instruments aiming to integrate the concerns of sustainable development into the key economic decisions.

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